### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

### DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

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## SUBSURFACE INVESTIGATION

# SOIL AND ROCK LEGEND. TERMS. SYMBOLS, AND ABBREVIATIONS

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS			
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLICHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm. ACCORDION TO STANDARD PENETRATION TEST (AGSHTO 126, ASTM D-1586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE; CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED).  GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS	HARD ROCK IS MON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH MON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PEMETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAT S, GEM PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.  ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.  AQUIFER - A WATER BEARING FORMATION OR STRATA.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE
VER STIFF, GAM SULY CLA. MOST WITH INTERECEDE FINE SWID LIVERS, HIGHLY PLUSTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED,  MINERALOGICAL COMPOSITION	WEATHERED NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.	PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.  ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS  ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS (.35%, PASSING *200) (.85%, PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GMEISS, GABBRO, SCHIST, ETC.  NION-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCARGOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  - COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS.  A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-3-7-5 A-3 A-6, A-7  SYMBOL SYM	COMPRESSIBILITY  SLIGHTLY COMPRESSIBLE  MODERATELY COMPRESSIBLE  LIQUID LIMIT 31-50	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN L. COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE,  DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS
	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50  PERCENTAGE OF MATERIAL  ORGANIC MATERIAL  GRANULAR SILT- CLAY  OTHER MATERIAL	SEDIMENTARY SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.  WEATHERING	MASSIVE ROCK.  DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
- 240 36 PK/306 PK/31 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%  LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
PLASTIC INDEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN	MODERATELY ORGANIC         5 - 10%         12 - 20%         SOME         20 - 35%           HIGHLY ORGANIC         >10%         >20%         HIGHLY         35% AND ABOVE    GROUND WATER	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V. SLIJ) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE,	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
USUAL TYPES STONE FRAGS. OF MAJOR GRAVEL AND MATERIALS SAND GRAVEL AND GRAVEL AND SAND SOILS SOILS  AMOUNTS OF ORGANIC ORGANIC MATTER  AMOUNTS OF ORGANIC MATTER	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.  ▼ STATIC WATER LEVEL AFTER 24 HOURS.	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 2.5 cm. DPEN JOINTS MAY CONTAIN CLAY. IN GRANTOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
GEN. RATING AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE SUBGRADE	E PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN  (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS  DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED  WITH FRESH ROCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
P.I. OF A-7-5 \(\leq \text{Li.}\) - 30 :P.I. OF A-7-6 \(\rightarrow\) L.L 30  CONSISTENCY OR DENSENESS    CONSISTENCY OR DENSENESS   RANGE OF UNCONFINED   RANGE OF STANDARD   RANGE OF UNCONFINED	SPRING OR SEEPAGE  MISCELLANEOUS SYMBOLS	MODERATELY  ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL  SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH  (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY
PRIMARY SOIL TYPE COMPACTINESS OR CONSISTENCY PENETRATION RESISTENCE (N-VALUE) COMPRESSIVE STRENGTH (N-VALUE)	ROADWAY EMBANKMENT WITH SOIL DESCRIPTION  ROADWAY EMBANKMENT WITH SOIL DESCRIPTION  AUGER BORING  AUGER BORING  AUGER BORING  AUGER BORING  AUGER BORING	IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
URNERHELY	SOIL SYMBOL AUGER BORING S- BULK SAMPLE  ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS  ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON SAMPLE	(SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, YIELDS SPT N VALUES > 100 BLOWS FER 30 cm.  VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 19 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN
VERY SOFT	ST- SHELBY TUBE  SINGUL BOUNDARIES  MONITORING WELL  SAMPLE  PIEZOMETER  RS- ROCK SAMPLE	(V. SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINI	SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILT-CLAY	TTTTT ALLUVIAL SOIL BOUNDARY  INSTALLATION RT- RECOMPACTED  SLOPE INDICATOR  TRIAXIAL SAMPLE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
TEXTURE OR GRAIN SIZE	25/825 DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE  ROCK STRUCTURES SPT N-VALUE	ROCK HARDNESS	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053	SOUNDING ROD     REP SPT REFUSAL  ABBREVIATIONS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS.
BOULDER	AR - AUGER REFUSAL FRAC FRACTURED SL SILT, SILTY	TO DETACH HAND SPECIMEN.  MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 6 mm DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12' 3'  SOIL MOISTURE - CORRELATION OF TERMS	BT - BORING TERMINATED FRAGS FRAGMENTS S.L SLIGHTLY CL CLAY HI HIGHLY TCR - TRICONE REFUSAL CPT - CONE PENETRATION TEST MED MEDIUM W - MOISTURE CONTENT	BY MODERATE BLOWS.  MEDIUM CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  HARD CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE	STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:  TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.  TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	☐ DPT - DYNAMIC PENETRATION TEST NP - NON PLASTIC	POINT OF A GEOLOGISTS PICK.  SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	BENCH MARK: BL 350 -L- STA. 239+41.649, 6.234 LT.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	• - VOID RATIO PMT - PRESSUREMETER TEST 7/d - DRY UNIT WEIGHT F FINE SAP SAPROLITIC FOSS FOSSILIFEROUS SD SAND, SANDY	PIECES CAN BE BROKEN BY FINGER PRESSURE.  VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 25 mm  SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	ELEVATION: 287.541 METERS
PLASTIC   SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	FINGERNAIL. FRACTURE SPACING BEDDING	NOTES:
(PI) PL PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING TERM THICKNESS	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	MOBILE B- CLAY BITS X AUTOMATIC MANUAL	WIDE 110 3 THINLY BEDDED 0.05 - 0.5 m	
REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		CLOSE 5 TO 30 cm VERY THINLY BEDDED 10 - 50 mm  VERY CLOSE LESS THAN 5 cm THICKLY LAMINATED 2.5 - 10 mm  THINLY LAMINATED < 2.5 mm	
PLASTICITY  PLASTICITY  PLASTICITY	CME-45C HARD FACED FINGER BITS -N	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	-
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW	X CME-550 TUNG,-CARBIDE INSERTS -H	DIRECTION OF THE PROPERTY OF T	
LOW PLASTICITY         6-15         SLIGHT           MED. PLASTICITY         16-25         MEDIUM	CASING W/ ADVANCER HAND TOOLS:  PORTABLE HOIST X TRICONE	FRIABLE RUBBING WITH FINCET FREES INDIRECTORS SAMPLE.  GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.  MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
HIGH PLASTICITY 26 OR MORE HIGH  COLOR	OTHER TRICONE TUNG,-CARB, HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	OTHER OTHER SOUNDING ROD VANE SHEAR TEST	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.  EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
	OTHER	SAMPLE BREAKS ACROSS GRAINS.	REVISED 09/15/00